

## PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE  
 in its capacity as elected Office

Date of mailing (day/month/year) 07 March 2002 (07.03.02)	
International application No. PCT/US01/13924	Applicant's or agent's file reference 32867W003
International filing date (day/month/year) 01 May 2001 (01.05.01)	Priority date (day/month/year) 02 May 2000 (02.05.00)
Applicant CALL, Edwin	

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

14 November 2001 (14.11.01)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Odile ALIU Telephone No.: (41-22) 338.83.38
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**RECEIVED****PATENT COOPERATION TREATY**WO 01/83842  
PCT/US01/13924

Paw

SMITH, GAMBRELL &amp; RUSSELL, LLP

**PCT**

From the INTERNATIONAL BUREAU

To:

WEILACHER, Robert, G.  
Smith, Gambrell & Russell, LLP  
Suite 800  
1850 M Street, N.W.  
Washington, DC 20036  
ETATS-UNIS D'AMERIQUE**NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES**

(PCT Rule 47.1(c), first sentence)

Date of mailing (day/month/year) 08 November 2001 (08.11.01)		<b>IMPORTANT NOTICE</b>	
Applicant's or agent's file reference 32867W003			
International application No. PCT/US01/13924	International filing date (day/month/year) 01 May 2001 (01.05.01)	Priority date (day/month/year) 02 May 2000 (02.05.00)	
Applicant POWER SPRAY, INC. et al			

1. Notice is hereby given that the International Bureau has **communicated**, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this notice:  
KP, KR, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AL, AM, AP, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CO, CZ, DE, DK, EA, EE, EP, ES, FI, GB, GE, HU, IL, IS,  
JP, KE, KG, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, OA, PL, PT, RO, RU, SD, SE, SG, SI,  
SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ZA

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this notice is a copy of the international application as published by the International Bureau on  
08 November 2001 (08.11.01) under No. WO 01/83842

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and the PCT Applicant's Guide, Volume II.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.91.11
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# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: ROBER G. WEILACHER  
SMITH, GAMBRELL & RUSSELL, LLP  
1850 M STREET, N.W.  
SUITE 800  
WASHINGTON DC 20036

## PCT

### NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 32867W003	Date of Mailing (day/month/year) <b>02 AUG 2001</b>
International application No. PCT/US01/13924	International filing date (day/month/year) <b>01 MAY 2001</b>
Applicant POWER SPRAY, INC.	

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.  
**Filing of amendments and statement under Article 19:**  
 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):  
**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report; however, for more details, see the notes on the accompanying sheet.  
**Where?** Directly to the International Bureau of WIPO  
 34, chemin des Colombettes  
 1211 Geneva 20, Switzerland  
 Facsimile No.: (41-22) 740.14.35  
**For more detailed instructions, see the notes on the accompanying sheet.**
2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.
3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
  - ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
  - ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.
4. **Further action(s):** The applicant is reminded of the following:
 

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in rules 90 bis 1 and 90 bis 3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231  
Facsimile No. (703) 305-3230

Authorized officer  
KATHERINE A. BAREFORD DEBORAH THOMAS  
PARALEGAL SPECIALIST  
Telephone No. (703) 308-0661

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 32867W003	<b>FOR FURTHER ACTION</b>	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US01/13924	International filing date ( <i>day/month/year</i> ) 01 MAY 2001	(Earliest) Priority Date ( <i>day/month/year</i> ) 02 MAY 2000
Applicant POWER SPRAY, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

#### I. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:
 

☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the  
☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.
2. ☐ Certain claims were found unsearchable (See Box I).
3. ☐ Unity of invention is lacking (See Box II).
4. With regard to the title,
 

☒ the text is approved as submitted by the applicant.  
☐ the text has been established by this Authority to read as follows:
5. With regard to the abstract,
 

☒ the text is approved as submitted by the applicant.  
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is Figure No. \_\_\_\_
 

☐ as suggested by the applicant.  
☐ because the applicant failed to suggest a figure.  
☐ because this figure better characterizes the invention.

☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US01/13924**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : C 23 C 4/06, 4/08; B32B 15/01, 15/04

US CL : 427/455; 428/658, 659, 688

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 427/455; 428/658, 659, 688

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 3,497,434 A (LITTAUER) 24 February 1970, see column 1, line 40 through column 2, line 50.	1-3, 5, 11, 13, 15, 16, 18 ----- 4,6-10,12,14,17
Y	US 4, 992,337 A (KAISER et al) 12 February 1991, see 4, line 45 through column 5, line 10.	4,6
X	JP 61-124679 A (KURARAY CO LTD) 12 June 1986), see the abstract.	1 - 3 , 5 - 6 , 11 , 13,15,16,18

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 04 JUNE 2001	Date of mailing of the international search report 02 AUG 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer KATHERINE A. BAREFORD Telephone No. (703) 308-0661 DEBORAH THOMAS PARALEGAL SPECIALIST

## NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under Article 19. The Notes are based on the requirements of the Patent Cooperation Treaty and of the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule" and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

### INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

**What parts of the international application may be amended ?**

The claims only.

The description and the drawings may only be amended during international preliminary examination under Chapter II.

**When ?** Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

**Where not to file the amendments ?**

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

**How ?** Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

**What documents must/may accompany the amendments ?**

**Letter (Section 205(b)):**

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confounded with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

**PCT  
REQUEST**

For receiving Office use only

International Application No. \_\_\_\_\_

International Filing Date \_\_\_\_\_

Name of receiving Office and  
"PCT International Application" \_\_\_\_\_

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty

Applicant's or agent's file reference 32867W003 (if desired)(12 characters maximum)

**Box No. I - TITLE OF THE INVENTION**  
SYSTEM FOR PROTECTION OF SUBMERGED MARINE SURFACES

**Box No. II - APPLICANT(S)**

Name and Address: *(Family name followed by given name - for a legal entity, full official designation. Address must include postal code/country name.)*

POWER SPRAY, INC.  
1409 Air Rail Road  
Virginia Beach, VA 23455  
U.S.A.

☐ This person is also inventor.

Telephone No.:  
202-659-2811

Facsimile No.:  
202-659-4329

Teleprinter No.: \_\_\_\_\_

State (i.e., country) of nationality: US

State (i.e., country) of residence: US

This person is applicant for purposes of:

☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

**Box No. III - FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS**

Name and Address: *(Family name followed by given name - for a legal entity, full official designation. Address must include postal code/country name.)*

Edwin Call  
965 South Spigel Road  
Virginia Beach, VA 23454  
U.S.A.

This person is:

☐ applicant only  
☐ applicant & inventor  
☒ inventor only (if this check-box is marked, do not fill in below.)

State (i.e. country) of nationality: US

State (i.e. country) of residence: US

This person is applicant for purposes of:

☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

**Box No. IV - AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The person identified is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name & Address *(Family name followed by given name-for a legal entity, full official designation. Address must include postal code/country name.)*

Robert G. Weilacher  
Smith, Gambrell & Russell, LLP  
1850 M Street, N.W., Suite 800  
Washington, D.C. 20036 US

Telephone No.:  
202-659-2811  
Facsimile No.:  
202-659-4329  
Teleprinter No.: \_\_\_\_\_

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

☐ Mark this check-box where no ☐ or common representative is/has been appointed and the ☐ above is used instead to indicate a special address to which correspondence should be sent.

### Box No. V - DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

#### Regional Patents

- ☒ **AP** ARIPO Patent: KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** Eurasian Patent: AZ Azerbaijan, BY Belarus, KZ Kazakhstan, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention of the PCT
- ☒ **EP** European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, DE Germany, DK Denmark, ES Spain, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT.
- ☒ **OA** OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, please specify)

National Patent (if other kind of protection or treatment is desired, please specify):

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> AL Albania                           | <input checked="" type="checkbox"/> LT Lithuania                                 |
| <input checked="" type="checkbox"/> AM Armenia                           | <input checked="" type="checkbox"/> LU Luxembourg                                |
| <input checked="" type="checkbox"/> AT Austria                           | <input checked="" type="checkbox"/> LV Latvia                                    |
| <input checked="" type="checkbox"/> AU Australia                         | <input checked="" type="checkbox"/> MD Republic of Moldova                       |
| <input checked="" type="checkbox"/> AZ Azerbaijan                        | <input checked="" type="checkbox"/> MG Madagascar                                |
| <input checked="" type="checkbox"/> BB Barbados                          | <input checked="" type="checkbox"/> MK The Former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria                          | <input checked="" type="checkbox"/> MN Mongolia                                  |
| <input checked="" type="checkbox"/> BR Brazil                            | <input checked="" type="checkbox"/> MW Malawi                                    |
| <input checked="" type="checkbox"/> BY Belarus                           | <input checked="" type="checkbox"/> MX Mexico                                    |
| <input checked="" type="checkbox"/> CA Canada                            | <input checked="" type="checkbox"/> NO Norway                                    |
| <input checked="" type="checkbox"/> CH & LI Switzerland & Liechtenstein  | <input checked="" type="checkbox"/> NZ New Zealand                               |
| <input checked="" type="checkbox"/> CN China                             | <input checked="" type="checkbox"/> PL Poland                                    |
| <input checked="" type="checkbox"/> CZ Czech Republic                    | <input checked="" type="checkbox"/> PT Portugal                                  |
| <input checked="" type="checkbox"/> DE Germany                           | <input checked="" type="checkbox"/> RO Romania                                   |
| <input checked="" type="checkbox"/> DK Denmark                           | <input checked="" type="checkbox"/> RU Russian Federation                        |
| <input checked="" type="checkbox"/> EE Estonia                           | <input checked="" type="checkbox"/> SD Sudan                                     |
| <input checked="" type="checkbox"/> ES Spain                             | <input checked="" type="checkbox"/> SE Sweden                                    |
| <input checked="" type="checkbox"/> FI Finland                           | <input checked="" type="checkbox"/> SG Singapore                                 |
| <input checked="" type="checkbox"/> GB United Kingdom                    | <input checked="" type="checkbox"/> SI Slovenia                                  |
| <input checked="" type="checkbox"/> GE Georgia                           | <input checked="" type="checkbox"/> SK Slovakia                                  |
| <input checked="" type="checkbox"/> HU Hungary                           | <input checked="" type="checkbox"/> TJ Tajikistan                                |
| <input checked="" type="checkbox"/> IS Iceland                           | <input checked="" type="checkbox"/> TM Turkmenistan                              |
| <input checked="" type="checkbox"/> IL Israel                            | <input checked="" type="checkbox"/> TU Turkey                                    |
| <input checked="" type="checkbox"/> JP Japan                             | <input checked="" type="checkbox"/> TT Trinidad & Tobago                         |
| <input checked="" type="checkbox"/> KE Kenya                             | <input checked="" type="checkbox"/> UA Ukraine                                   |
| <input checked="" type="checkbox"/> KG Kyrgyzstan                        | <input checked="" type="checkbox"/> UG Uganda                                    |
| <input checked="" type="checkbox"/> KP Democratic People's Rep. of Korea | <input checked="" type="checkbox"/> US United States of America (Continuation)   |
| <input checked="" type="checkbox"/> KR Republic of Korea                 | <input checked="" type="checkbox"/> UZ Uzbekistan                                |
| <input checked="" type="checkbox"/> KZ Kazakhstan                        | <input checked="" type="checkbox"/> VN Viet Nam                                  |
| <input checked="" type="checkbox"/> LK Sri Lanka                         |  |
| <input checked="" type="checkbox"/> LR Liberia                           |  |
| <input checked="" type="checkbox"/> LS Lesotho                           |  |

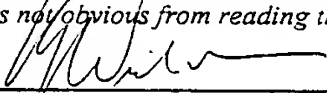
Check-boxes reserved for designating States (for the purposes of national patent) which have become party to the PCT after issuance of this sheet:

☐

☐

☒ and any other PCT member states as of the filing date not listed above

In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of \_\_\_\_\_. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month limit.)

<b>Box No. VI - PRIORITY CLAIM</b>		Further priority claims are indicated in the Supplemental Box C	
The priority of the following earlier application(s) is hereby claimed:			
Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
(1) United States	2 May 2000	60/201.306	USPTO
(2)			
Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required): <input checked="" type="checkbox"/> The receiving Office is hereby requested to transmit to the International Bureau a certified copy of the earlier application(s) identified above at item(s): (1)			
<b>Box No. VII - EARLIER SEARCH</b>			
Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identified such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request:			
Country (or regional office):      Date (day/month/year):      Number:			
<b>Box No. VIII - CHECK LIST</b>			
This international application contains the following number of sheets:  1. request:            4 sheets 2. description:       13 sheets 3. claims:             2 sheets 4. abstract:            1 sheet 5. drawings:           0 sheets  Total: 20 sheets		This international application is accompanied by the item(s) marked below:  1. <input type="checkbox"/> separate signed power of attorney 2. <input type="checkbox"/> copy of general power of attorney (3 copies) 3. <input type="checkbox"/> statement explaining lack of signature 4. <input type="checkbox"/> priority document(s) (specify): 5. <input checked="" type="checkbox"/> fee calculation sheet  6. <input type="checkbox"/> separate indications concerning deposited microorganisms 7. <input type="checkbox"/> nucleotide and/or amino acid sequence listing 8. <input checked="" type="checkbox"/> other check	
Figure No. <u>1</u> of the drawings (if any) should accompany the abstract when it is published.		Language of filing of the international application: English	
<b>Box No. IX - SIGNATURE OF APPLICANT OR AGENT</b>			
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).			
 Robert G. Weilacher, Reg. No. 20,531		May 1, 2001 Date	

For Receiving Office use only	
1. Date of actual receipt of the purported international application  3. Corrected date of actual receipt due to later but timely receiving papers or drawings completing the purported international application:  4. Date of timely receipt of the required corrections under PCT Article 11(2):  5. International Searching Authority specified by the applicant:      ISA/	2. Drawings:  <input type="checkbox"/> received:  <input type="checkbox"/> not received:  6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid
For International Bureau use only	
Date of receipt of the record copy by the International Bureau	

# FEE CALCULATION SHEET Annex to the Request

International application No.

Date stamp of the receiving Office

Applicant or agent's file reference  
032867W002

Applicant Power Spray, Inc.

## CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE.....240 [T]  
 2. SEARCH FEE ..... 700 [S]  
 International Search to be carried out by US  
*(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)*  
 3. INTERNATIONAL FEE  
 Basic Fee  
 The international application contains 20 sheets.  
 first 30 sheets ..... 382 [b1]  
 ..... x ..... = ..... 0 [b2]  
 remaining sheets x additional amount  
 Add amounts entered at b1 and b2 and enter total at B ..... 382 [B]  
 Designation Fee  
 The international application contains all designations  
6 x 82 = ..... 492 [D]  
 number of designations x amount of des. fee  
*(If that total exceeds the figure which corresponds to the amount of the designation fee multiplied by ten, enter the latter figure in box D.)*  
 Add amounts entered at B and D and enter total at I ..... 874 [I]  
 4. FEE FOR PRIORITY DOCUMENT ..... 15. [P]  
 5. TOTAL FEES PAYABLE  
 Add amounts entered at T, S, I and P, and  
 enter total in the TOTAL Box ..... 1829  
**TOTAL**

☐ The designation fee is not paid at this time.

### Mode of Payment

- ☐ authorization to charge      ☐ bank draft      ☐ coupons  
     deposit account (see below) ☐ cash      ☐ postal money order  
☒ cheque      ☐ revenue stamps      ☐ other (specify)

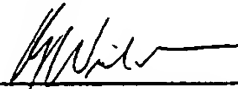
### Deposit Account Authorization

- The RO/US ☐ is hereby authorized to charge the total fees indicated above to my deposit account.  
☒ is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.  
☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

02-4300

Deposit Account Number

01/05/01  
Date (day/month/year)

 (20.531)  
Signature and Reg. No.

## PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF RECEIPT OF  
RECORD COPY

(PCT Rule 24.2(a))

To:

WEILACHER, Robert, G.  
Smith, Gambrell & Russell, LLP  
Suite 800  
1850 M Street, N.W.  
Washington, DC 20036  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 26 June 2001 (26.06.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 32867W003 (if	International application No. PCT/US01/13924

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

POWER SPRAY, INC. (for all designated States except US)  
CALL, Edwin (for US)

RECEIVED

International filing date : 01 May 2001 (01.05.01)  
Priority date(s) claimed : 02 May 2000 (02.05.00)  
Date of receipt of the record copy  
by the International Bureau : 06 June 2001 (06.06.01)  
List of designated Offices :

JUL 10 2001  
SMITH, GAMBRELL & RUSSELL, L.L.P.

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW  
EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM  
EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR  
OA : BF, BJ, CF, CG, CI, CM, GN, GW, ML, MR, NE, SN, TD, TG  
National : AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CO, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS,  
JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG,  
SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ZA

## ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase  
☒ confirmation of precautionary designations  
☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer: Beate Giffo-Schmitt
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

**INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE**

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. It is the applicant's responsibility to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**CONFIRMATION OF PRECAUTIONARY DESIGNATIONS**

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

**REQUIREMENTS REGARDING PRIORITY DOCUMENTS**

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

To:

WEILACHER, Robert, G.  
Smith, Gambrell & Russell, LLP  
Suite 800  
1850 M Street, N.W.  
Washington, DC 20036  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 10 September 2001 (10.09.01)	
Applicant's or agent's file reference 32867W003	IMPORTANT NOTIFICATION
International application No. PCT/US01/13924	International filing date (day/month/year) 01 May 2001 (01.05.01)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 02 May 2000 (02.05.00)
Applicant POWER SPRAY, INC. et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
02 May 2000 (02.05.00)	60/201,306	US	13 July 2001 (13.07.01)

RECEIVED

SMITH, GAMBRELL &amp; RUSSELL, L.L.P.

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

David MALEK

Telephone No. (41-22) 338.83.38

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ \_\_\_\_\_

# PCT

## CHAPTER II

### DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only		
Identification of IPEA		Date of receipt of DEMAND
<b>Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION</b>		Applicant's or agent's file reference
International application No. PCT/USO1/13924	International filing date (day/month/year) 01/May/2001 (01.05.01)	(Earliest) Priority date (day/month/year) 02/May/2000 (02.05.00)
Title of invention SYSTEM FOR PROTECTION OF SUBMERGED MARINE SURFACES		
<b>Box No. II APPLICANT(S)</b>		
Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.) POWER SPRAY, INC. 1409 Air Rail Road Virginia Beach, VA 23455 US		Telephone No. 757-460-3336
		Facsimile No. 757-363-9131
		Teleprinter No.
		Applicant's registration No. with the Office
State (that is, country) of nationality: US		State (that is, country) of residence: US
Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.) Call, Edwin 965 South Spigel Road Virginia Beach, VA 23454 US		
State (that is, country) of nationality: US		State (that is, country) of residence: US
Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality:		State (that is, country) of residence:
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.		

**Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**The following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*Weilacher, Robert G.  
Smith, Gambrell & Russell, LLP  
1850 M Street, Suite 800  
Washington, D.C. 20036 US

Telephone No.

202-659-2811

Facsimile No.

202-659-4329

Teleprinter No.

Agent's registration No. with the Office

20531

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:\***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filedthe description ☒ as originally filed☐ as amended under Article 34the claims ☐ as originally filed☒ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34the drawings ☒ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

\* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English.....

☒ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☐ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

## Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- |  |   |        |
|--|---|--------|
| 1. translation of international application                              | : | sheets |
| 2. amendments under Article 34   | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19  | : | sheets |
| 5. letter  | : | sheets |
| 6. other ( <i>specify</i> )  | : | sheets |

For International Preliminary Examining Authority use only

received not received

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

- |  |  |
|--|--|
| 1. <input checked="" type="checkbox"/> fee calculation sheet                             | 5. <input type="checkbox"/> statement explaining lack of signature     |
| 2. <input type="checkbox"/> original separate power of attorney                          | 6. <input type="checkbox"/> sequence listing in computer readable form |
| 3. <input type="checkbox"/> original general power of attorney                           | 7. <input type="checkbox"/> other ( <i>specify</i> ):                  |
| 4. <input type="checkbox"/> copy of general power of attorney; reference number, if any: |  |

## Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).



Robert G. Weilacher

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.

☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

## PCT

## FEE CALCULATION SHEET

## Annex to the Demand

International application No. <b>PCT/US01/13924</b>	For International Preliminary Examining Authority use only
Applicant's or agent's file reference <b>032867.003</b>	Date stamp of the IPEA
Applicant <b>POWER SPRAY, INC.</b>	
<b>CALCULATION OF PRESCRIBED FEES</b>	
1. Preliminary examination fee .....	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">490</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin-left: 5px;">P</div>
2. Handling fee ( <i>Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.</i> ) .....	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">137</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin-left: 5px;">H</div>
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box .....	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">627</div>
<div style="border: 1px solid black; display: inline-block; padding: 2px 20px;">TOTAL</div>	
<b>MODE OF PAYMENT</b>	
<input checked="" type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash
<input type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps
<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons
<input type="checkbox"/> bank draft	<input type="checkbox"/> other (specify):
<b>AUTHORIZATION TO CHARGE (OR CREDIT) DEPOSIT ACCOUNT</b> <i>(This mode of payment may not be available at all IPEAs)</i>	
<input type="checkbox"/> Authorization to charge the total fees indicated above.	IPEA/ <u>US</u>
<input checked="" type="checkbox"/> <i>(This check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)</i> Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.	Deposit Account No.: <u>02-4300</u>
	Date: <u>14 November 2001</u>
	Name: <u>Robert G. Weilacher</u>
	Signature: _____

## PATENT COOPERATION TREATY

PCT

INFORMATION CONCERNING ELECTED  
OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

From the INTERNATIONAL BUREAU

To:

WEILACHER, Robert, G.  
Smith, Gambrell & Russell, LLP  
Suite 800  
1850 M Street, N.W.  
Washington, DC 20036  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 07 March 2002 (07.03.02)		
Applicant's or agent's file reference 32867W003		IMPORTANT INFORMATION
International application No. PCT/US01/13924	International filing date (day/month/year) 01 May 2001 (01.05.01)	Priority date (day/month/year) 02 May 2000 (02.05.00)
Applicant POWER SPRAY, INC. et al		

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR  
National : AU, BG, CA, CN, DE, GB, IL, JP, KP, KR, MN, NO, NZ, PL, RO, RU, SE, SK, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW  
EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM  
OA : BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG  
National : AL, AM, AT, AZ, BB, BR, BY, CH, CO, CZ, DK, EE, ES, FI, GE, HU, IS, KE, KG, KZ, LK,  
LR, LS, LT, LU, LV, MD, MG, MK, MW, MX, PT, SD, SG, SI, TJ, TM, TR, TT, UA, UG, UZ, VN, ZA

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. (41-22) 740.14.35	Authorized officer:  Odile ALIU  Telephone No. (41-22) 338.83.38
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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
8 November 2001 (08.11.2001)

PCT

(10) International Publication Number  
**WO 01/83842 A1**

- (51) International Patent Classification<sup>7</sup>: **C23C 4/06**, [US/US]; 965 South Spigel Road, Virginia Beach, VA 23454 (US).  
4/08, B32B 15/01, 15/04
- (21) International Application Number: PCT/US01/13924 (74) Agent: **WEILACHER, Robert, G.**; Smith, Gambrell & Russell, LLP, Suite 800, 1850 M Street, N.W., Washington, DC 20036 (US).
- (22) International Filing Date: 1 May 2001 (01.05.2001)
- (25) Filing Language: English (81) Designated States (*national*): AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CO, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ZA.
- (26) Publication Language: English
- (30) Priority Data: 60/201,306 2 May 2000 (02.05.2000) US (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- (63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:  
US Not furnished (CON)  
Filed on Not furnished
- (71) Applicant (*for all designated States except US*): **POWER SPRAY, INC.** [US/US]; 1409 Air Rail Road, Virginia Beach, VA 23455 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (*for US only*): **CALL, Edwin**
- Published:**  
— with international search report  
— with amended claims
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: SYSTEM FOR PROTECTION OF SUBMERGED MARINE SURFACES

(57) Abstract: A method for protection of submerged marine surfaces from bio-fouling which is carried out by spraying the surface to be protected with a solvent free, zinc or zinc based alloy coating produced by a thermal spray process.

WO 01/83842 A1

## SYSTEM FOR PROTECTION OF SUBMERGED MARINE SURFACES

## Reference to a Related Application -

- 5 This application claims the benefit of the Provisional Application 60/201,306 which is relied on and incorporated herein by reference.

## Introduction and Background

- 10 The invention is a system comprised of metallized coatings and thermal spray procedures that produces a unique protective coating. In particular, the invention consists of preparing and applying zinc and zinc-based alloys. These materials are thermal sprayed with unique metallizing processes and procedures onto surfaces of submerged marine structures. This invention differs from other metallized coatings in that it performs the  
15 function of bio-fouling protection and cathodic protection.

- The practice of coating steel and concrete with thermally sprayed metal coatings for corrosion protection has been accepted for many years for use on offshore platforms, oil storage tanks, gas transmission facilities, bridges, rail cars, locks and dams, bulkheads,  
20 ships, barges, pulp and paper mills, and petrochemical plants. Thermal spray coatings are often called metallized coatings. Many metals and alloys exist; aluminum and zinc are the most widely used metals for corrosion control. Aluminum metallized coatings (AMC) and zinc metallized coatings (ZMC) provide long-term corrosion protection for greater than 30 years. Compared to paint, both AMC and ZMC have superior corrosion  
25 and abrasion resistance.

- Aluminum and zinc are anodic to most metals and protect these more noble substrates in electrolytic environments. Aluminum is more noble than zinc; therefore, it corrodes less rapidly than zinc. As a result, aluminum metallized coatings are more commonly used  
30 for corrosion protection in marine environments, rather than zinc metallized coatings. This is especially the case for immersion applications. Since the aluminum metallized

coating will corrode less rapidly than zinc, AMC has been the standard choice for submerged, splash zone, and above water marine applications.

Thermal spray coatings have been used for corrosion protection on steel structure since the early 1900's. More recently, zinc metallized coatings are applied directly to the reinforced concrete surface to prevent future corrosion of the rebar. Highway bridges, parking garages, and other concrete structures can be protected using these (CP) cathodic protection systems. Zinc is the choice metal for cathodic protection, because it is one of the least noble metals and is compatible with concrete. When zinc is in bimetallic contact with steel in an electrolyte, the zinc will corrode or "sacrifice itself" and provide a level of protection to the more noble metal. The contact may be direct or indirect.

#### Purpose of Anti-fouling Coatings

Marine animals and plant life accumulate on submerged surfaces located in intertidal regions. In the marine industry, this is referred to as fouling or bio-fouling. Barnacles and other fouling organisms are serious problems for owners of boats, ships, industrial facilities, buoys, power stations, etc. who keep their property in the intertidal region. This is referred to as hard fouling. Anti-fouling paints are designed to prevent fouling for a defined period of time. Owners who keep their property in the water year-round are faced with hauling, scraping, and painting on a routine basis. The present invention prevents hard fouling on submerged surfaces. It does not claim to prevent soft fouling like algae and slime.

#### Environmental Demand for Alternative Anti-fouling Coatings

It has been recognized that a threat is placed on the earth's environment through the use of two types of antifouling paints: 1) paints containing tributyltin (TBT) and 2) paints containing copper or cuprous oxide.

Butyltins are organic tin compounds. Tributyltin is a butyltin compound. For decades, TBT has been put in marine paints to inhibit the growth of unwanted organisms such as algae and barnacles. A small amount of TBT is potent enough to kill aquatic life. When TBT paint is applied to ship hulls and ship components, the TBT leaches or "dissolves" into the water. When it settles to the bottom of the water table, it poisons and may kill marine life. Strong scientific evidence links TBT to adverse biological effects in fish and shellfish. Recent studies indicate that TBT and other butyltin compounds are causing deaths in sea mammals.

- 10 There is continuing evidence that TBT is dangerous to humans. Two Murray State University chemists conducted a study on human adults. The study showed that butyltin disrupts the function of critical human immune cells. Butyltins are the same compounds found in anti-fouling paints, wood preservatives, and dish sponges. The Murray State study found that when humans were exposed to "environmentally relevant" concentrations of tributyltin for as little as an hour the tumor-killing ability of natural killer cells was inhibited.

Many European countries have already issued a complete ban on TBT use in marine coatings. The United Nations International Marine Organization has issued resolutions to issue legally binding legislation by 2003. The legislation will globally prohibit the use of anti-fouling systems that contain organotins such as tributyltin. Despite the evidence that TBT is harmful to humans and marine life, it is not banned in the United States.

Shipyards can apply TBT paints to large commercial vessels, but it is banned on smaller boats. Special licensing permits are required for applying TBT paints. Releases of TBT are limited through the issuance of state permits. Shipyards are required to comply with these levels. In short, TBT paints have provided a solution to boat owners but at an extreme expense to the environment, marine life and possibly humans. The environmental and health hazards of TBT are issuing a call for alternatives, and the political response to ban the use of TBT in marine paints creates a demand for proven antifouling coatings without environmental hazards.

The present invention contains no pesticides, biocides, or tributyltin. Since this product is a thermal spray coating, it contains no solvents or volatile organic compounds (VOCs). This is an important distinction from anti-fouling paints. Most of the solvents in these paints contain chemicals that are listed by the US Environmental Protection  
5 Agency as a hazardous material. Therefore, the production and use of these paints requires adherence to strict regulations because of the risk to health and safety of humans. When applied, liquid solvents in the paint coating evaporate. These solvents which contain VOC pose dangers to the atmosphere by ozone depletion. Furthermore, the containment, handling and disposal of the used paint cans and byproducts of the  
10 application process create several environmental problems.

Copper has been used heavily in the marine coatings industry. Eighteenth and nineteenth century wooden hull vessels were regularly clad with copper sheeting to prevent biofouling. Today, most antifouling paints contain high amounts of cuprous oxide. The  
15 US Navy and many scientific research organizations are investigating the release rates of copper from antifouling marine coatings. These organizations are issuing concerns about the possible damage copper is doing to the marine environment.

This invention includes the use of zinc-based metallized coatings to prevent hard fouling  
20 on submerged surface. Zinc-copper is one of the alloys selected for this invention. It can be stated, however, that the release rate of zinc, or copper or any of the metals on alloys used to form a metallized coating is much lower than that of a paint product, because the copper metal is only being released through oxidation. Paints contain copper salts that are soluble in water. Metallized coatings produced by this invention are insoluble in  
25 water. In fact, the metals or alloys used in this invention and thermal spray processes are insoluble in water.

#### Summary of the Invention

30 The primary purpose of this invention is to protect surfaces of submerged marine structures from bio-fouling and more particularly, hard fouling such as from barnacles.

More particularly, the present invention relates to a process for the protection of submerged marine structures in need of protection against hard fouling, such as barnacles because of the environment in which such marine structures are placed, for example in salt water. A second aspect of the invention relates to cathodic protection.

5

In carrying out this invention, a 100% metal coating is applied directly to the substrate. The coating is applied using a thermal spray process. The term metallizing is often used instead of thermal spray. The two terms are interchangeable. The present invention contains no solvents or volatile organic compounds (VOC). The coating is a zinc or zinc-  
10 based alloy. The coating is not designed as an ablative coating or self-polishing coating like other marine paints; therefore, minimal leaching of the coating into the water table occurs.

The purpose of this invention is to provide a coating system that performs better and is  
15 more desirable environmentally than conventional paint systems that contain toxins or heavy metals. The coating of the present invention is comprised of zinc and zinc-based alloys. It contains no tributyltin (TBT), volatile organic compounds (VOC), pesticides, or biocides.

20 The coatings of this invention are intended to perform in conjunction with and more efficiently than other cathodic protection systems that require external electrical power supplies or sources. The present invention involves no external power supplies; therefore it involves less maintenance and repair than electrically impressed protection systems. An advantage of this invention is that the coating can be sprayed directly to the substrate. It  
25 provides a system more feasible and cost-effective than spraying copper-nickel to a resin insulating layer. Thermal sprayed zinc and zinc based alloys provide a more durable coating than a copper-nickel and resin coating system, because a metal-to-metal bond is stronger than a metal-to-resin bond. The present invention is a zinc-based coating sprayed directly to the surface of the marine structures and surfaces. The surface to be  
30 protected by this invention can be any surface which needs protection from fouling, including but not limited to steel, aluminum, brass, stainless steel, concrete, fiberglass,

plastic, and wood.

The present invention provides a cost-effective way to perform all stated functions, essentially to provide a commercially feasible application process for industries

5 including, but not limited to, pleasure craft, oil and gas, power generation, shipping, petrochemical, paper and pulp, aids to navigation, and water treatment facilities. Thus, the present invention provides protection for structures, including, but not limited to ship hulls and boat hardware (propellers, rudders, shafts, trim tabs, strainers, etc.), buoys, locks, dams, off-shore oil rigs, piers, wharfs, bulk heads, pipelines, seawater intakes.

10

In fulfilling its objectives, this invention avoids the problems associated with other coating systems. Current bio-fouling control techniques cause galvanic corrosion of the coated metal structure. For example, the present invention avoids galvanic corrosion problems caused when placing dissimilar metals like copper on or near steel or

15 aluminum.

#### Detailed Description of Invention

The steps, methods, and components of the invention are illustrated as follows. The

20 surface metal is power washed with fresh, clean water to remove soluble salts and bulk biomass. Next, the metal surface is blasted to a suitable extent; for example to a white metal according to standard SSPC-SP-5. A suitable anchor-tooth profile is created for a thermal spray coating. For non-metal surface, such as concrete, fiberglass, plastic, composites, etc., other blasting techniques are required.

25

Next, a zinc-based metal wire is selected that is compatible with the substrate. The coating is then applied using a thermal spray process such as electric arc, combustion wire, or combustion powder. Electric arc is preferred. Uniform coverage is achieved by applying multiple layers of the coating and overlapping passes with the spray gun.

30

A sealer may be added to the thermal spray coating to provide additional benefits. Sealers for thermal spray coatings are used by those familiar with the art. The zinc-based metal wire is composed of 50-100% zinc. The remaining metals include, but are not limited to, copper, carbon, tin, nickel, aluminum, and magnesium.

5

Because the present invention involves the spraying of zinc-based alloys, it avoids the toxic problems associated with tributyltin paints and copper paints. In addition, zinc does not create galvanic corrosion when sprayed on steel or aluminum structures. The following metals are the most commonly used in the manufacture of marine structures or  
10 vessels: nickel, brass, bronze, stainless steel, and copper-nickel. Finally, zinc provides cathodic protection to submerged metallic marine structures.

A preferred method is to modify standard thermal spray procedures. The purpose of the modifications is to produce a harder and more durable coating when compared to normal  
15 corrosion control coatings and to produce superior protection against bio-fouling with the added bonus of cathodic protection. Thermal spray industry standards for air pressure and spray parameters such as spray voltages have been elevated to provide a coating that is better as an anti-foulant than other thermal spray coatings. The modification of industry standards improves the anti-fouling characteristics of the invention.

20

Another preferred method is to select thermal spray equipment that produces a spray of small particles. The inventor has found that spraying small particles produces a smoother and more desirable coating. The inventor has discovered that using equipment that sprays large particles can cause a courser, uneven coating. It should also be noted that in many  
25 ways, the technique and skill of the thermal spray technician is important to the quality of the coating. The inventor prefers the use of an electric-arc, twin wire system for applying the coating.

It is preferred to use a two wire system with arc spraying techniques. Thus, one of the  
30 wires may be zinc and the second wire can be zinc or copper, aluminum, tin, nickel or magnesium.

As mentioned above, copper is known to have anti-fouling characteristics. However, copper and copper-nickel alloys may create electrolysis problems. Copper and copper-nickel alloys will cause galvanic corrosion to aluminum and steel when the coating is  
5 damaged and exposes the less noble substrate in an electrolytic environment. The inventor's use of zinc and zinc-based alloys provides a better coating than copper and copper-nickel alloys for two reasons. First, zinc and zinc-based alloys are compatible with more surfaces than a copper or copper-nickel alloy. Second, in tests conducted by the inventor it was demonstrated that zinc metallized coatings performed better than  
10 copper metallized coatings. Performance was rated by ability to prevent hard fouling.

The present invention is durable in harsh marine environments. Resin-based paints craze and crack badly when left in the sun for an extended period of time. In addition, the anti-fouling characteristics of traditional point coatings are lost if the paint remains out of  
15 water for extended periods of time (30-90 days). Most resin-based paints use copper or cuprous-oxide as the active anti-fouling agent. Ultraviolet for extended out of water have no negative effect on the performance of zinc or zinc-based metallized coatings in accordance with the present invention.

20 The present invention also acts as a passive cathodic protection system. Since the invention is passive, it is easier to maintain and more economical than an impressed current cathodic protection system. It contains no expensive power supplies, reference cells, wiring, etcetera. The complexity of an active cathodic protection system makes it more expensive and less reliable for the owner of the marine structure.

25 The coating system of the present invention protects surfaces of submerged marine structures, such as ship hulls, from bio-fouling with the additional characteristic of cathodic protection. Not only does the invention provide improved performance when compared to existing paint systems, the design is also cost-effective and commercially feasible. No insulating layers of paint are required with this invention. The zinc or zinc-  
30 based thermal spray coating can be applied directly to the substrate of the structure; therefore, it is more economical because it has fewer application steps.

The cathodic protection characteristics of this invention will also provide the owner of the vessel or structure with the added benefit of life-cycle cost savings by reducing the corrosion rate and consumption of zinc anodes. For example, structure owners routinely  
5 place zinc anodes on underwater metal surfaces to protect the dissimilar metal from corrosion. This invention when applied to components or sections of the structure will reduce the consumption rate of the structure's zinc anodes. In this event, the zinc metallized coating or zinc-based metallized coating works in concert with the zinc anodes. Certain outside factors uncontrolled by this invention may prevent this benefit.  
10 They include but are not limited to the amount of stray electrical current present on the vessel, the level of stray electrical fields in the surrounding water, and the manner in which electrical devices on or near the structure are wired.

The performance of paints on moving boat parts like propellers and shafts have been  
15 poor. Paints have failed due to their low adhesion characteristics. A boat owner with a propeller coated with a paint with low bond strength will find that the paint first starts to disbond and fall off around the outside perimeter of the blades. Due to the motion of propellers through the water and abrasion caused by solids in the water, the paint is eventually completely worn off the blades. This will allow the unprotected surface to be  
20 fouled. The bond strength of this invention is at least five times higher than that of paints. In addition, the expansion and contraction rate of the zinc and zinc-based metallized coating is similar to the base metals (brass, aluminum, steel, stainless steel to name a few). Therefore, this invention has superior protection because it adheres to the metal and will not crack, disbond, or come off as easily.

25

#### Examples of Invention

It was noted through many years of experience in cleaning and painting boat hulls that  
30 paint was effective for ten to sixteen months at best. After this period, it was found that the hull needed to be repainted. It was also noted that the hardware (propellers, shafts,

rudders, struts, trim tabs, etc.) of the boat fouled more quickly than the hull. This problem was due to the limited bond strength of paint. Prop wash, movement of the boat through the water, and other actions caused the paint to prematurely come off. Thermal spray coatings offer at least five times the bond strength of paint. As a result of these  
5 observations, experiments were performed with metallized coatings. The inventor has extensive experience in thermal spray coatings used for corrosion protection and cathodic protection. The inventor also has experience cleaning and painting boat hulls.

This invention provides an entire coating system for cathodic protection.

10

#### Example 1

A requirement for corrosion protection existed for a dive platform attached to a dive boat. Four carbon steel supports for the dive platform were coated. Since aluminum is the preferred metal for marine underwater corrosion protection, thermal sprayed  
15 aluminum was applied to all the supports except one which was coated with thermal sprayed zinc.

Based on the principles of galvanic corrosion, to those experienced in the art it was unconventional to place zinc in a marine underwater environment since zinc corrodes  
20 more quickly than aluminum. The results of this test were surprising and revealing in that the zinc-coated support did not corrode as quickly as expected and showed no signs of bio-fouling. In contrast, the aluminum-coated steel was badly corroded and fouled. This was caused by contact of the aluminum metallized coating and the copper-rich paint in an electrolyte. Severe electrolysis ensued by the dissimilar metals being in contact  
25 with one another. This caused the paint to peel further exposing the steel to marine growth. This caused the chain reaction that accelerated with time. Through this example, it was discovered that two problems were solved - bio-fouling and corrosion protection -- by using the ZMC. Further, the zinc even went beyond its initial, intended purpose by providing a third benefit: cathodic protection to the carbon steel support bracket.

30

#### Example 2

Thermal sprayed zinc and zinc-based alloys were applied to aluminum propellers, brass propellers, aluminum samples, steel samples, and brass samples. Some propellers were placed on boats and others were placed in saltwater rivers and bays tributary to the Chesapeake Bay and Atlantic Ocean. It was concluded from these tests that zinc and  
5 zinc-based thermal spray coatings protect the base metal from bio-fouling, and galvanic corrosion.

#### Example 3: Test Propeller (static)

A three-bladed brass propeller was coated with a copper/zinc metallized coating. Using a  
10 nylon rope, the propeller was hung into a saltwater tributary to the Chesapeake Bay. The propeller remained in the water for one full season (approximately four months). At the end of the season, the propeller was pulled out for analysis. A garden hose was used to remove the soft fouling on the propeller. The propeller had no barnacle growth or other hard fouling.

15 The tips of two of the propeller blades were cut off and submitted to a laboratory for analysis. The purpose of the analysis was to determine if the substrate was protected from corrosion. The laboratory took sections from the blade tips for analysis. These sections were mounted in epoxy resin and then polished. Using microscopy, the laboratory found that "there was no apparent attack or disorder in the parent metal."  
20

#### Example 4: Long Creek Test 2000 - 2001

Two 2" x 2" metal pieces were coated. The first piece was aluminum coated with a zinc metallized coating. The second piece was a brass piece coated with a copper-zinc metallized coating. These two samples were placed on string and hung alongside a dock.  
25 A third uncoated carbon steel sample was hung in the water with the coated samples. The dock is located on a saltwater creek that feeds into the mouth of the Chesapeake Bay. These three samples were exposed for one summer season (approximately four months).

30 The results showed no fouling or serious corrosion on the metallized samples. Surface oxidation was visible on the two coated samples. The good performance of these

coatings contrasted with the untreated sample. The carbon steel was heavily corroded and delaminated. A few large barnacles and several small barnacles were also attached to the uncoated sample. The test reaffirmed the fouling results of the propeller test (Example 1).

5

#### Example 5: Test Float

On June 26, 2000, a test float was placed at the same marina location mentioned in the above examples. The test float was made out of PVC piping. Twenty-six 2" x 2" metal samples were tied to the float using nylon string. The samples were made of steel,  
10 aluminum, brass, or stainless steel. Seven different metallized coatings were coated on each type of metal. The coatings included a zinc metallized coating and six zinc-based alloy metallized coatings. One uncoated sample of each metal was tied to the float as well.

The results of the tests are as follows:

15

1. The zinc metallized coating performed well on all substrates.
2. Depending on the substrate, the six zinc-based coatings varied in performance. .
3. Overall, the test indicated that zinc and zinc-based metallized coatings perform well in  
20 preventing fouling.
4. It is important that the zinc or zinc-based alloy be correctly selected for each individual application.

#### Example 6: Two 24" 3-bladed Propellers 1998 - 2000

25 In November of 1998, two three-bladed propellers were coated for a boat docked on the Elizabeth River in Norfolk, Virginia. The owner of the boat uses the boat infrequently, so the propellers are often sitting still for several weeks at a time. This is a good test subject for testing the effectiveness of zinc and zinc-based alloy metallized coatings. Barnacles strike on metal and need time to adhere to the surface. If a boat is used  
30 regularly, then the barnacles are swept off the metal surfaces by the action or forward motion of the boat.

This boat was moored at the dock in Elizabeth River for two years. In December 2000, the boat was hauled out for the first time since November 1998. The propellers were free from heavy fouling except for a few small barnacles around the hub of the propeller.

Under normal conditions, the owner stated that the propellers would have been entirely  
5 coated with barnacles. Due to the customer's satisfaction with the results, he asked the inventor to apply the same metallized coating to the boat shafts, struts, rudders and trim tabs. The inventor mobilized a crew to the boat yard and provided the service.

Example 7: Zinc anodes on two shafts connected to two 24" 3-bladed propellers (same  
10 propellers as described in Example 6)

The boat described in Example 6 is not only an example of the anti-fouling characteristics of the invention, it is also an example of the cathodic protection provided by the invention.

15 The shafts on this boat were stainless steel. The propellers were brass. To protect the less noble propeller material from corrosion, the boat owner placed one zinc anode on each of the shafts. The zinc anodes on the shaft of this boat were in excellent condition after two years of use. The anode held its original shape and was only slightly depleted. The boat owner stated that prior to 1998 and under the same marina conditions, the boat's  
20 anodes would be completely depleted in less than two years.

Typically, boat owners in the Chesapeake Bay region can expect their zinc anodes to require replacement at least once per year. This example demonstrates the cathodic protection offered by this invention in submerged marine environments.

25

Further variations and modifications of the foregoing will be apparent to those skilled in the art and are intended to be encompassed by the claims appended hereto.

30

I claim:

1. A method for protection of submerged marine surfaces from bio-fouling comprising:  
5 spraying the surface to be protected with a solvent free, zinc or zinc based alloy coating produced by a thermal spray process.
2. The method according to claim 1 wherein the coating is free of tributyltin.
3. The method according to claim 1 wherein said spraying is in the absence of a volatile organic compounds (VOC).
- 10 4. The method according to claim 1 wherein the surface is a metal member selected from the group consisting of carbon steel, aluminum, stainless steel, brass, copper, copper-nickel, monel, lead and bronze.
5. The method according to claim 1 wherein the coating is applied directly to the surface of the structure without additional insulating layers.
- 15 6. The method according to claim 1 wherein the surface is fiberglass, plastic, composites, concrete, or wood.
7. The method for protecting of a submerged metal marine surface comprised of washing the surface to be protected with water to remove any soluble salts and biomass, blasting the metal surface to white metal, selecting a metal wire containing zinc  
20 compatible with said surface, carrying out a thermal spray process to apply a zinc or zinc based coating to said surface to thereby achieve protection against bio-fouling.
8. The method according to claim 4 wherein said thermal spray process is by electric arc, combustion wire or combustion powder.

9. The method according to claim 7 further comprising applying multiple layers by thermal spray to obtain a uniform coverage by the zinc or zinc based alloy on the said surface.

10. The method according to claim 4 further comprising optionally adding a  
5 sealer on top of the thermal spray coating.

11. The method according to claim 1 wherein a thermal spray metallized coating is deposited and composed of 50-100% zinc.

12. The method according to claim 9 wherein zinc metal coating additionally contains a member selected from the group consisting of copper, carbon, tin, nickel,  
10 aluminum, magnesium and mixtures thereof.

13. A method for cathodically protecting surfaces of marine structures which are to be placed underwater comprising thermally spraying said surfaces with a solvent free, zinc or zinc based alloy coating.

14. The method according to claim 12 wherein said marine structure is the hull of  
15 a ship, ship hardware, buoys, locks, dam, off-shore oil rigs, piers, wharfs bulk heads, pipelines and sea water intakes.

15. A marine structure which when in use is submerged in water having been coated by the method according to claim 1.

16. A marine structure has been coated according to the method of claim 13.

20 17. A propeller having been coated by the method of claim 1.

18. A submerged marine surface coated with the method according to claim 1.

### AMENDED CLAIMS

[received by the International Bureau on 01 October 2001 (01.10.01);  
original claims 1, 5, and 7 amended; remaining claims unchanged (1 page)]

1. A method for protection of submerged marine surfaces from bio-fouling without external electrical power comprising:  
  
spraying the surface to be protected with a solvent free, zinc or zinc based alloy coating produced by a thermal spray process.
2. The method according to claim 1 wherein the coating is free of tributyltin.
3. The method according to claim 1 wherein said spraying is in the absence of a volatile organic compounds (VOC).
4. The method according to claim 1 wherein the surface is a metal member selected from the group consisting of carbon steel, aluminum, stainless steel, brass, copper, copper-nickel, monel, lead and bronze.
5. The method according to claim 1 wherein the coating is applied directly to the surface of the structure without any insulating layers.
6. The method according to claim 1 wherein the surface is fiberglass, plastic, composites, concrete, or wood.
7. The method for protecting of a submerged metal marine surface without external electrical power comprised of washing the surface to be protected with water to remove any soluble salts and biomass, blasting the metal surface to white metal, selecting a metal wire containing zinc compatible with said surface, carrying out a thermal spray process to apply a zinc or zinc based coating to said surface to thereby achieve protection against bio-fouling.
8. The method according to claim 4 wherein said thermal spray process is by electric arc, combustion wire or combustion powder.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US01/13924

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : C 23 C 4/06, 4/08; B32B 15/01, 15/04

US CL : 427/455; 428/658, 659, 688

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 427/455; 428/658, 659, 688

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 3,497,434 A (LITTAUER) 24 February 1970, see column 1, line 40 through column 2, line 50.	1-3, 5, 11, 13, 15, 16, 18 — 4,6-10,12,14,17
Y	US 4, 992,337 A (KAISER et al) 12 February 1991, see 4, line 45 through column 5, line 10.	4,6
X	JP 61-124679 A (KURARAY CO LTD) 12 June 1986), see the abstract.	1 - 3 , 5 - 6 , 11 , 13,15,16,18

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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